Atmos. Chem. Phys. Discuss., 12, C6682–C6683, 2012
www.atmos-chem-phys-discuss.net/12/C6682/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Using measurements of the aerosol charging state in determination of the particle growth rate and the proportion of ion-induced nucleation" *by* J. Leppä et al.

Anonymous Referee #1

Received and published: 6 September 2012

This is a unique and important work. The authors came up with a novel way to evaluate the accuracy of the diameter growth rate (GR) obtained from the charged fractions, ion mobility distributions, and particle size distributions. The study on this topic requires reference GRs which are known to be accurate. The most of the reference GRs used in the previous studies were the modal GR obtained by analyzing the growth of particle size distribution (PSD) during the period of new particle formation (NPF). However, the modal GR may have significant measurement uncertainties and the modal GR might have significant bias from the true GRs; therefore, it has been difficult to validate the "the charged-fraction-approach" since accurate reference GRs have not been available. On the other hand, the authors of this paper generated accurate particle size

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distributions of electrically charged and neutral particles by numerical simulations of NPF events. The unknown in the numerical simulation is the growth rate of neutral and charged particles; therefore, the authors have applied previously suggested GR mechanisms in their numerical simulations and accounted for the potential variations in the charged fraction under different growth mechanisms, which is very clever. I strongly encourage that authors take advantage of this unique approach to continue evaluate the uncertainty and the bias of the GRs obtained from "the charged-fraction approach" under different types of NPF events observed over the globe.

I have only one general comment.

I suggest calculating the IIN+/- using the charged fraction obtained from the simulated results and GRs obtained by either fitting or iterated approach. Then, compare these IIN+/-with known IIN+/- from simulation.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 21867, 2012.